

# The Marantaceae of Malaya

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**Summary of characters.** *Plants* rhizomatous, the rhizome a sympodium, each new element ending in an erect leafy shoot; rhizome elements usually short. *Branches* of all kinds, both vegetative and on the inflorescence, bearing first a 2-keeled *prophyll* backing on to the axis which bears the branch. *Erect shoots* bearing one to several distichous leaves, the leaves sometimes all basal, sometimes separated by short or long internodes, and usually a terminal inflorescence; in a few cases the inflorescence borne on a separate shoot having only short sheaths, without foliage leaves. *Leaf-blade* usually elliptic to ovate, nearly always glabrous except sometimes for hairs on either side of the midrib beneath, sometimes with the upper surface variegated, the lower surface sometimes purple; lateral veins oblique, close, fine, with little distinction between main and subsidiary veins; *petiole* short or long, the portion immediately below the blade being thickened and round in section, often slightly curved; *sheath* short or long, sometimes hairy, the edges usually converging upwards and meeting in a point at the base of the petiole, often without a distinct ligule. *Inflorescence* always with condensed cymose partial inflorescences in the axils of primary bracts, each successive branch of the cyme enclosed in a 2-3-keeled *prophyll*, often also with an unkeeled *mesophyll* opposite the *prophyll* and closing the gap between its edges. *Primary bracts* arranged in a simple spike, either distichous or spirally, or with lateral spikes in the axils of the lower bracts; spikes of second and third order sometimes developed. *Flowers* always paired, the two flowers of a pair usually opening together, but sometimes not, and sometimes unequally stalked, one flower being the mirror image of the other. *Ovary* inferior, unilocular or trilocular (trilocular in Malayan species), one ovule in each locus. *Sepals* free to the base, usually equal, usually narrow, sometimes persistent on the apex of the fruit. *Corolla* forming a tube with 3 lobes; lobes usually narrowly triangular or oblong. *Staminodes* and *stamen*

attached to the corolla-tube, sometimes forming a tube which extends some distance beyond the attachment of the corolla-lobes. *Staminodes of the outer whorl* two, rarely one; when two, placed on either side of the stamen, petaloid, often unequal, large or small. *Staminodes of the inner whorl* two, unequal, called the *fleshy staminode* and the *hooded staminode*. *Fleshy staminode* small or large, petaloid, usually broad, of thicker texture than the outer staminodes, bearing an oblique fleshy callus on which the stigma rests after release from the hooded staminode. *Hooded staminode* usually small, with hooded apex and usually a downward-pointing lobe on one side, enclosing the style and stigma until disturbed, and then releasing them. *Stamen* about as long as hooded staminode, bearing one half of an anther on one side, the other side more or less developed into a petaloid lamina (usually narrow). *Style and stigma* held erect at first by the hooded staminode, when released the upper part springing downwards to form an inverted U, the stigma resting on the callus of the fleshy staminode. *Fruit* dehiscent or indehiscent, containing 1 to 3 seeds; in dehiscent fruits the seeds bearing a bilobed basal aril, in indehiscent fruits the aril lacking. *Seed* containing a curved or sometimes straight embryo embedded in perisperm, with an opening for germination of the root closed by a special plug as in Musaceae and Zingiberaceae; a hollow (the perisperm canal) extending from near the plug into the interior of the seed, in the bay formed by the curve of the embryo, or parallel to the embryo when the latter is straight (*Phrynium capitatum*).

**Rhizome.** In most Marantaceae the rhizome elements are short, the erect shoots standing close together. In *Maranta arundinacea* extended horizontal rhizome elements without leaves are produced, and shorter ones in other species, but in none native in Malaya. The rhizome bears numerous roots, which are usually not very thick, stiff, with few main branches but with many short secondary roots which stand out at right angles.

**Branching.** The presence of a 2-keeled prophyll, backing the primary axis, as the first leaf on every new branch is apparently universal in the family. A similar prophyll occurs in several other families of Monocotyledons, including (in the Order Scitamineae) Cannaceae (where it is hardly

keeled) Lowiaceae but not Zingiberaceae. It is said to occur also in the sub-family Strelitzioideae of Musaceae, but is not obvious in several species of Heliconia.

The places at which branches can arise vary in different genera, and give rise to differences of habit. In some cases tufts of branches are produced; the basal internode of each new branch is very short, and a further branch may be produced in the axil of the first leaf. Such tufts are produced both on vegetative parts of plants and on inflorescences. Schumann also states that sometimes several buds may arise in one axil; but I have not seen this in Malayan species.

**Structure of erect shoots.** The first leaf on a new shoot is a prophyll backing the main axis. Loesner states that the following leaves are distichous, beginning with the prophyll; but this is in many cases not clear. It more often appears that the bladeless sheaths which usually follow the prophyll, and the following leaves, lie in a plane at right angles to the prophyll. The transition to this plane seems sometimes to be abrupt, sometimes apparently gradual; but the exact relationships of successive leaves are not easy to understand. Once the plane of the distichous leaves is established, it is usually quite uniform; but Schumann remarks that in some cases a slight twist may be observed. I have not seen this in Malayan species; but, so far as present information goes, none of them has many leaves on a single shoot. The number of leaves on each shoot is usually limited and fairly constant within a species.

Erect shoots of Malayan Marantaceae are of two types. In the commonest, all leaves on each shoot, or all but one, are borne close together near the base, the internodes being very short. In some cases, the last internode may be much elongated, a single leaf being raised well above the others, with the inflorescence beyond it at the apex of the shoot. The long internode is here called the peduncle, because it functions as such. The inflorescence may be produced immediately above the attachment of the upper leaf, or it may be raised still higher on a further extension of the axis of the shoot. Whether a long internode between two leaves occurs or not, the essential structure is the same. Within the genus *Phrynium* both conditions may occur.

The other type of erect shoot is found only in *Donax* and *Schumannianthus* (among Malayan Marantaceae). These

plants are known locally as *Bemban* and have long slender shoots of a single internode arising from the base of the plant, with tufts of leaf-shoots at their upper ends, each leaf-shoot ending in an inflorescence. The structure of these groups of shoots is sympodial. The original stem bears two or three leaves only beyond its long internode; the basal one of these then bears an axillary shoot, the basal leaf of this another, and so a series of shoots is produced, all close together, and each of limited growth with 2 or 3 leaves only.

**Leaf-blade.** As in the other families of Scitamineae, the leaf is rolled in the bud, one half rolled inwards in a series of coils, the other half rolled outside it. The half rolled outside is always narrower than the other half when the leaf expands. In some genera of Marantaceae the wider half is always to the same side of the midrib (right or left); in others alternately the right and then the left side is widest. The former condition is called homotropic, the latter antitropic. Leaves of Malayan genera appear to be all homotropic, but in some cultivated plants they are antitropic.

Variegation occurs in several Malayan species, consisting usually of darker or lighter oblique stripes on either side of the midrib. There are several fairly commonly cultivated exotic species with much-variegated leaves, mostly from tropical America.

The position of the blade, whether erect or bent backwards, is often characteristic and is controlled by the thickened upper part of the petiole mentioned below. It should be noted that the turgidity of this organ may vary and with it the angle of the blade.

**Petiole.** The single character by which any member of the family can be distinguished at a glance is the thickening of the upper part of the petiole (or of the whole petiole where this is short, as in *Donax*). This thickened part is usually somewhat curved, round in section, and closes up the groove at the base of the midrib. Internally it has long and closely set radially disposed cells, in one or two series, which contain no chlorophyll; their turgidity appears to maintain the rigidity of the whole structure. This thickened part of the petiole seems to have no special name. It is sometimes called the knee, on account of its curvature, but this is not a good name for this whole structure, which may be 10 cm. long or more. It is sometimes called a pulvinus.



The rest of the petiole is usually quite terete, sometimes laterally flattened. In *Stachyphrynium Griffithii* (and perhaps also in other species inhabiting wet ground) it has longitudinal lacunae, closed by numerous cross-walls.

The sheath has broad thin edges which overlap the other sheaths, as usual in Scitamineae. These edges converge upwards and usually meet at an acute angle at the base of the petiole proper; sometimes they form a raised ligule where they meet, but more often not, and the ligule is never so conspicuous as in Zingiberaceae.

**Inflorescence.** In all Malayan species except *Stachyphrynium Griffithii* and *S. cylindricum* the inflorescence is terminal on a leaf-shoot. In these two species it is on a separate shoot branching from the base of a leaf-shoot and bearing only bladeless sheaths below the inflorescence. Such inflorescences are rare in Marantaceae.

The inflorescence consists of an axis bearing primary bracts (usually broad and imbricating) arranged either in two ranks or spirally. In simple spikes (genera *Stachyphrynium* and exceptionally *Phrynium*) each bract contains a condensed monochasial cyme bearing a few flowers. In compound inflorescences the lower bracts have secondary spikes in their axils, and these again may have tertiary spikes in their lower axils, until in a species like *Phrynium capitatum* a compact head of many spikes is produced. This is exactly comparable with the close tufts of leaf-shoots at the ends of the erect stems of *Donax*. In *Phacelophrynium* the inflorescence is large and the lower bracts much spaced, so that it has a series of groups of subsidiary spikes and then a simple terminal spike. In all cases the subsidiary spikes bear first a 2-keeled prophyll backing on the axis of the main spike.

Where the inflorescence is accompanied by a leaf, attached to the axis just below it (as often in *Phrynium*), the young inflorescence is protected by the sheath of the leaf, which stands erect, its petiole continuing the line of the axis. When the inflorescence emerges, it must do so obliquely; and if it is much branched the branches must spread horizontally or even some of them below the horizontal, owing to reasons of space. Thus the inflorescence may appear to be lateral in the axil of the leaf, but it is not so.

The condensed cymes in the axils of the bracts are peculiar in having all the flowers in pairs (except in a few

non-Malayan species). Each successive branch of the cyme ends in a pair of flowers, not a single flower as in Zingiberaceae. This pair of flowers is backed by the usual 2-keeled prophyll; in front it bears a simple bract enclosed by the edges of the prophyll, and in the axil of this comes the next pair of flowers, protected again by their prophyll; and so on up to as many as ten pairs of flowers in some Calatheas, but not more than about five pairs in native Malayan Marantaceae.

The second and later prophylls often have a median keel on their backs (sometimes a very high one); this keel lies between the flowers at the back of the prophyll, and the three keels together form two small chambers in which the flower-buds develop. The middle keel is however not always developed, and even in one inflorescence it is not equally developed on all prophylls. Schumann states that such 3-keeled prophylls are only found in *Phacelophrynium* among Malayan genera, but this is not correct.

The bracts facing the prophylls are called *mesophylls* by Schumann, and we will use that term for convenience. If the inflorescence in the axil of a bract is truly a monochasial cyme with a pair of flowers at the apex of each branch (and this appears to be the simplest interpretation), then each new branch is in the axil of a mesophyll; the mesophylls are in fact an essential feature of the scheme. But in some genera (e.g. species of *Stachyphrynium*) the mesophylls are quite absent. This must be a secondary development, and species lacking mesophylls are then to be regarded as reduced, not primitive. Schumann states that mesophylls are lacking in *Phrynium*, but this is incorrect.

In some genera small bracteoles of various kinds occur, as well as prophylls and mesophylls. Among Malayan plants such bracteoles are only found in *Donax* and *Schumannianthus*, where they take the form of small fleshy bodies, quite un-leaf-like in appearance. In cultivated Calatheas the bracteoles are sometimes rather long and terete.

**Flowers.** The flowers are quite asymmetrical in structure; but the two flowers of a pair are mirror images one of the other, so that together they make a symmetrical whole. They usually open together, and appear to be quite equal in status; but sometimes one is regularly opened a day or two before the other (*Phrynium capitatum*), and often the two have pedicels of different length. In the most nearly related

family, Cannaceae, the flowers are arranged in cincinni of two flowers only, the cincinni arranged spirally on the main axis of the shoot. It is possible to imagine that the pair of flowers of Marantaceae once was in the form of a cincinnus of two flowers as in *Canna*; but the arrangement of the bracteoles (in such species of Marantaceae as possess them) does not correspond to such an arrangement. Schumann reports that the rudiment of a third flower between the two is sometimes found; we may thus perhaps interpret this rudiment as the real apex of the group, and the pair of flowers as lateral, as in the ultimate branchings of a dichasial cyme. The flowers are nearly always quite small.

**Ovary.** The ovary is inferior, trilocular in all Malayan species, with one ovule in each loculus. In the tribe Maranteae only one loculus is present, the other two remaining rudimentary.

**Sepals.** The sepals are quite free, as in *Canna*. They vary a good deal in length, those of *Donax* being very short, while those of some species of *Phrynium* are 2.5 cm. long.

**Corolla.** The tube of the corolla varies much in length. The three lobes are usually narrow and are not the most conspicuous part of the flower.

**Staminodes.** The staminodes and stamen together are joined to the corolla-tube, or sometimes to a longer tube extending beyond the corolla-tube. There are normally four staminodes and one stamen, all five organs being different. They represent five of the six stamens normally present in a flower of *Liliiflorae*, one of the outer whorl being always absent.

The two staminodes of the outer whorl (one only in *Phacelophrynium* but two in all other Malayan genera) are similar in appearance but usually unequal in size. They are placed one on each side of the stamen. In many cases they are as long as the corolla-lobes, or longer, and are the largest organs of the flower. They are usually delicate in texture, and often difficult to distinguish clearly in dried flowers.

One of the three inner members is a fertile stamen, but carries only half an anther. It is joined to a usually narrow petaloid appendage which may be longer or shorter than the anther.

The second of the inner staminodes is rather fleshy, much firmer than the outer staminodes, and usually has a fleshy flap or callus rising from its face; the callus is sometimes 2-lobed. This is called the *fleshy staminode* (staminodium callosum). It is sometimes called the labellum, but this is not a satisfactory term, as it is not at all comparable with the labella of Zingiberaceae nor of Orchidaceae.

The third inner staminode is always rather small. It is called the *hooded staminode* (s. cucullatum). The apex is hooded and the sides inflexed, one side having a triangular appendage or lobe which projects laterally or downwards. The hooded part of this staminode encloses the style and stigma.

**Style and stigma.** The style is joined to the inside of the flower-tube, not free from it as in Zingiberaceae; it is free only from the base of the hooded staminode. The stigma is 3-lobed, more or less irregularly, with a hollow between the lobes which is the receptive part. At the time of opening of the flower, the stigma has developed an internal tension which causes it to bend over with explosive force as soon as it is liberated from the hooded staminode. This liberation takes place as soon as the staminode is disturbed by a slight touch, or even by shaking the flower. When the stigma is so liberated, it bends over until it comes into contact with the fleshy staminode, on the callus of which it rests.

The anther sheds its pollen before the flower-bud opens (probably the day before) as in *Canna*. The pollen consists of large clear spherical grains which adhere together. In the bud, the anther is placed very near the style, and the pollen is deposited just below the stigma, in exactly the same way as in *Canna* (as reported by Costerus; see below). When the stigma is liberated from the hooded staminode, the pollen is on its back, on a flattened area, whence it may be removed by a visiting insect, if an insect has caused the liberation of the stigma. At the same time, if the insect has already gathered pollen from another flower, this pollen may come into contact with the hollow of the stigma as it passes downward. The possibility of cross-pollination in this way may undoubtedly exist, but has been rarely observed. It is however clear that self-pollination is almost impossible, as once the open mouth of the stigma is in contact with the fleshy staminode, no pollen can reach it.



**Floral morphology.** The above interpretation of the flower is that of Schumann, based on anatomical investigations of earlier authors. The stamen, fleshy staminode and hooded staminode are considered to represent the three members of the inner whorl of stamens. The Canna flower, on the other hand, though having the same number of parts, is much less easy to interpret and various authors have differed in their interpretation of it. The last investigation was by Costerus, who arrived at the new conclusion that the petaloid and fertile parts of the anther of Canna are of separate origin, the fertile part being a portion of one of the outer staminodes. Having arrived at this result (from a study of the course of vascular bundles in the flower-bud), Costerus proceeded to examine a Marantaceous flower, to see how the structure compared with that of Canna. He claims that the structure in the two cases is identical (see *Ann. Jard. Bot. Buitenz.* 30: 59-90 and pls. 13-14 1918). His theory is that the inner whorl of stamens is represented by the fleshy and hooded staminodes and by the petaloid appendage to the anther, the anther itself being part of an outer staminode. This would explain the curious fact that the two outer staminodes are not equal, the smaller one being that to which the half-anther is said to belong. The drawings given by Costerus are not very satisfactory, nor is his statement (to my mind) set forth sufficiently fully; but if his theory is correct it correlates exactly the structures of the flowers of Canna and Marantaceae, and also supplies a more symmetrical arrangement for Marantaceae by balancing the two outer staminodes. It does not however explain the complete absence of the smaller outer staminode in some cases (*Phacelophrynium* and *Calathea*).

A very remarkable parallel in the structure of Canna and Marantaceae concerns the stamen and stigma. In both cases the anther is in close contact with the style in the flower-bud, and in both pollen is shed before the flower opens, adhering to the style close to the stigma. The structure of the stigma in Canna is however quite different, and there is nothing comparable with the arrangement of the hooded staminode and the springing style. It is clear however that Cannaceae and Marantaceae are much more closely related together than either is to Zingiberaceae, where the flowers are quite symmetrical.

**Fruit and seed.** All Malayan Marantaceae belong to the division of the family having a trilocular ovary, but the ovules in all loculi do not always develop into seeds, so that one- or two-seeded fruits are not uncommon, and may be characteristic in certain species. A more definite distinction is that between dehiscent and indehiscent fruits.

The seeds have a two-lobed basal aril, the lobes usually much shorter than in Zingiberaceae. The aril-lobes also here serve a function which they do not perform in Zingiberaceae; they are turgid and assist in forcing the dehiscence of the fruit. Schumann states that they are absent in indehiscent fruits, but Gagnepain describes a small aril for the seeds of *Donax arundastrum*; if such an aril is present, it is rudimentary.

**System of Classification.** The main basis of classification of the Marantaceae of the New World (by far the major part of the family) was established by Körnicke and Eichler. A large number of the species were introduced to cultivation in Europe as ornamental plants, and so could be studied in the living state, and Eichler also received from S. America material preserved in alcohol. This classification of Eichler was maintained with minor changes in Schumann's monograph of the family in the *Pflanzenreich* (1902). But the Old World species had not received such a thorough study, nor had such good or ample material been available. Schumann sought to remedy the position by studying such material as he could, and he re-arranged the genera and described a number of new species. He also saw the original collections on which Blume based his species and re-described them. Schumann's work however was not altogether satisfactory, as may be judged from the fact that he entirely overlooked the presence of mesophylls and tricarinate prophylls in the inflorescence of *Phrynium*, and of mesophylls in some species of *Stachyphrynium*. He also misinterpreted the genus *Donax* Lour. and re-named it *Actoplanes*, instead of providing a new generic name for *Clinogyne dichotoma*.

Malayan Marantaceae (sixteen known species, two of them from imperfect single collections only) form such a small minority of the family that it is hard to judge the general validity of Schumann's scheme of genera from them alone. When ample good material from Borneo and Sumatra is available we shall be in a better position to

judge. At present it is clear that *Donax* and *Schumannianthus*, though closely allied, are distinct. *Phrynium*, in the sense here adopted, is a group of closely allied species, but whether it is sharply distinct from *Stachyphrynium* is not certain; and *Stachyphrynium* itself, as represented by the four Malayan species now known, is not at all uniform. *Stachyphrynium* is in fact much less uniform than Schumann thought. *Phacelophrynium* appears distinct, resembling *Calathea* on the one hand in its single outer staminode, and *Phrynium* on the other in its much branched inflorescence and absence of bracteoles (in the strict sense here used). Thus we retain Schumann's genera, amending the descriptions to cover details of the inflorescence which Schumann had not seen, while doubting the status of *Stachyphrynium*.

In general, the floral structure of *Marantaceae* is so uniform that it offers few characters by which main divisions of the family can be made. The only one of importance for Malayan species is the presence of one or two outer staminodes. Apart from this, as in *Zingiberaceae*, characters of the inflorescence (the arrangement of bracts, of branching, and the nature of the bracteoles) are of the greatest importance.

## KEY TO THE GENERA OF MARANTACEAE IN MALAYA

Leaves mostly on short shoots from the apex of long slender aerial stems; axes of inflorescence very slender, with narrow deciduous bracts

Fruit indehiscent, round and shining; flowers 1–2 cm.  
long 1. *Donax*.

Fruit dehiscent, 3-lobed, not shining; flowers 4 cm.  
long 2. *Schumannianthus*.

Leaves all from the base of the plant, except sometimes one on each shoot accompanying the inflorescence; axis of inflorescence stiff and erect; bracts imbricating, not deciduous

Inflorescence a simple unbranched spike

Bracts 2-ranked 3. *Stachyphrynium*.

Bracts spirally arranged 4. *Phrynium* (p.p.).

Inflorescence with secondary spikes in the axils of basal bracts, branch-spikes of 3rd and higher orders sometimes present

Bracts spirally arranged, all imbricating; two outer staminodes

4. *Phrynium*.

Bracts 2-ranked, the lowest two primary bracts widely spaced; one outer staminode only

5. *Phacelophrynium*.

**Distribution.** The family Marantaceae is almost confined to the wetter parts of the tropics. Like Zingiberaceae, it contains no xerophytic species, and most are shade-plants of the forest. The total number of species was stated by Loesener (in Pflanzenfam. Ed. 2, Vol. 15A; 1930) to be about 360, as against 1,300 in Zingiberaceae. A majority of the species are found in the northern part of South America, principally the large genus *Calathea* of about 130 species, almost entirely confined to that area. There are a number of species in the wetter parts of West Africa, but far fewer in East Africa, corresponding with climatic conditions. In Malaysia are far fewer species than in the New World. It is however quite likely that more exist in Borneo and Sumatra than are hitherto known; and those known are in most cases not well described.

In Malaya we here admit sixteen species, two of them known only from incomplete single collections. Four species are known to be common in all parts of the country; *Donax grandis*, *Schumannianthus dichotomus*, *Phrynium capitatum* and *Stachyphrynium Griffithii*. It is probable that several other species are much more common than is indicated by existing collections. Often they are neglected by collectors because of the absence of flowers (which may be seldom produced) or because flowers are not obvious and are overlooked (e.g. the small species of *Stachyphrynium*). As in Tropical Africa and America, a few Asiatic species are very widely distributed; among these are the first three of the four listed above. It is very probable that the fourth also occurs in other parts of Western Malaysia, but it has not been definitely reported, unless it is identical with *Stachyphrynium latifolium* of Java.

It seems arguable from existing information that the family Marantaceae is not in as active a state of evolution in Malaysia as Zingiberaceae. It is no doubt a more recent family, and also it must have originated in the American tropics, travelling by slow progress to Malaysia; but it has been here long enough to produce species which, though confined to shady forest, have spread over very large areas



(e.g. *Phrynium capitatum*). In Zingiberaceae we have a number of species which are certainly of local distribution, indicating active evolution, especially in the genera Scaphochlamys, and Geostachys. Perhaps the apparent lack of such in Marantaceae is due to the shorter time available and partly also to our ignorance. Though vegetatively most Marantaceae are vigorous, their floral organization is perhaps not an advance in efficiency on that of Zingiberaceae, though it is true that many species fruit quite freely.

### DONAX LOUR.

Tall plants of tufted habit with slender woody stems rising in a single internode from the ground to 2 m. or more tall and then in a much shorter internode to the next leaf. *Branching* regularly sympodial throughout, each axillary shoot bearing first a short 2-keeled sheath backing on to the main axis, then close to it an unkeeled bladeless sheath and a foliage leaf, then one or two more leaves separated by longer or shorter internodes and a terminal inflorescence. *Leaf-blades* of moderate size, ovate to elliptic; *petioles* short, the whole thickened and terete; sheaths much longer than petioles, with distinct short ligule. *Inflorescence* with few to many branches arising near the base, branches drooping or pendulous, all slender with alternate bracts at intervals of 1-1.5 cm.; bracts narrow with inflexed edges, much longer than the internodes. *Flowers* white, 1-2 pairs in the axil of each bract, each pair with a thin 2-keeled bract and 2 small fleshy bracteoles near the apex of their pedicels. *Common pedicel* of a pair of flowers nearly as long as the bract; separate pedicels of the two flowers unequal; pedicels thickened much at fruiting. *Sepals* short and narrow. *Corolla-tube* shorter or longer than sepals, lobes fairly long. *Tube of staminodes* and stamen about as long as corolla-tube. *Outer staminodes* 2, about as large as corolla-lobes. *Anther* with a small petaloid appendage of equal length. *Fruit* spherical indehiscent, containing 1-3 seeds; seeds not arillate.

Bentham, in *Genera Plantarum*, included in the genus *Clinogyne* both African and Asiatic species, taking the name of the genus from Salisbury (1812) who founded it on *Phrynium dichotomum* Roxb. (1810). Schumann, in preparing his monograph of the Marantaceae for Engler's *Pflanzenreich*, decided that the African species of *Clinogyne*

sensu Benth. constituted a genus distinct from the Asiatic ones; the latter he further divided into two genera. Confusingly, he used the name *Clinogyne* for the African species, though it had originally been used for an Asiatic one, on the plea that Salisbury's name was a *nomen nudum* and that the genus really dated from Bentham. Bentham indeed quoted the name as *nomen tantum*, and no other person had used it.

Having retained the name *Clinogyne* for the African species (a majority in Bentham's genus), Schumann had to find two new generic names for the Asiatic ones. One of them had already been called *Donax* by Loureiro; but Schumann (apparently following Ridley) applied Loureiro's name to the wrong species, and re-named Loureiro's genus *Actoplanes*. Thus the second Asiatic genus still lacked a name, which was supplied in 1904 by Gagnepain, who called it *Schumannianthus*. If however Salisbury's name was valid, this genus should have been called *Clinogyne*, and the African genus re-named.

We thus have the confusing situation that *Donax arundastrum* of Ridley and Schumann is *Schumannianthus dichotomus* (Roxb.) Gagnep.; the true *Donax arundastrum* of Loureiro is apparently equivalent to *Actoplanes canni-formis* of Schumann.

That Schumann was mistaken is clear from Merrill's statement (Trans. Am. Phil. Soc. N.S. 24: 120. 1935) that Rolfe had examined Loureiro's type; but indeed Loureiro's description itself is sufficient to indicate the true nature of his plant.

As indicated under *D. grandis*, there is some doubt as to the correct name of our species. If I am wrong in uniting it with Miquel's Sumatran species, the name *Ridleyi* of Schumann must be revived and a new combination made.

The habit of *Donax*, with its very long slender erect stems bearing leafy branches at their apex, is peculiar among Malayan plants and makes it easy to recognize. The leaf at the top of the long stem bears a branch in its axil; this in turn bears another branch in the axil of its first foliage leaf, and this again; after a time the original stem-apex flowers, fruits, dies and falls off, leaving a scar, and the next also, so that old stems bear a succession of such scars, arranged in a spiral manner. The stem then appears like a continuous axis with the scars of fallen lateral branches; but it is really a sympodium.

Not only the basal leaf of each new shoot may bear an axillary shoot, but the second leaf also and this again will repeat the branching process on a smaller scale producing in time a tuft of shoots, the old ones falling after they become old. Thus the whole plant consists of tufts of short leafy shoots separated by longer or shorter lengths of slender stem. Each tuft is very like the tuft of shoots produced by a rhizomatous species, but instead of the sympodium being at ground level it is raised high into the air.

The plants are well known to the Malays as *Bemban*, and are used extensively for making baskets.

Leaf-blade to 30 by 20 cm. widest near truncate base; corolla-tube much longer than sepals 1. *D. grandis*.

Leaf-blade to 20 by 9 cm. nearly elliptic; corolla-tube shorter than sepals 2. *D. parviflora*.

1. **Donax grandis** (Miq.) Ridl., J.S.B.R.A.S. 32: 176. 1899. Flora 4: 286. *Maranta grandis* Miquel, Fl. Ind. Bat. Suppl. 616. 1860. *Actoplanes Ridleyi* K. Schum., Pflanz.-enr. Marant. 35. 1902. Fig. 1.

*Main stems* 2-5 metres tall, then branching copiously; stems of second order to 50 cm. or more long. *Leaf-blade* varying much in size, to about 30 by 20 cm., sometimes proportionately narrower, nearly always widest in the basal half and usually quite near the almost truncate base, apex very shortly pointed, lower surface pale, hardly glaucous, with hairs on either side of the prominent midrib; *petiole* 1.5-2.5 cm. long, hairy on the upper surface; *ligule* very short; *sheath* varying much in length, to about 20 cm. long. *Inflorescence* branched, often with many branches, to about 30 cm. long, rachises slender. *Primary bracts* 1.2-1.5 cm. apart, 2.3-3.2 cm. long, each with 1 or 2 pairs of flowers. *Two-keeled bract* c. 1.5 cm. long. *Common pedicel* of pair of flowers 2.5-3 cm. long; pedicels of individual flowers c. 2.5 and 5 mm. long; a fleshy conical bracteole c. 2 mm. long at the junction of the pedicels and another on the longer pedicel. *Sepals* about 3 mm. long, narrow, white. *Corolla-tube* c. 8-10 mm. long, white; lobes 1.0-1.4 cm. long and 4-5 mm. wide, white. *Stamen-tube* a little longer (3-4 mm.) than corolla-tube. *Outer staminodes* equal or slightly unequal, widening from a narrow base, c. 1.3 cm. long and 5 mm. wide, white or tinged with yellow near tip. *Fleshy staminode* broad, yellowish, nearly as long as the outer

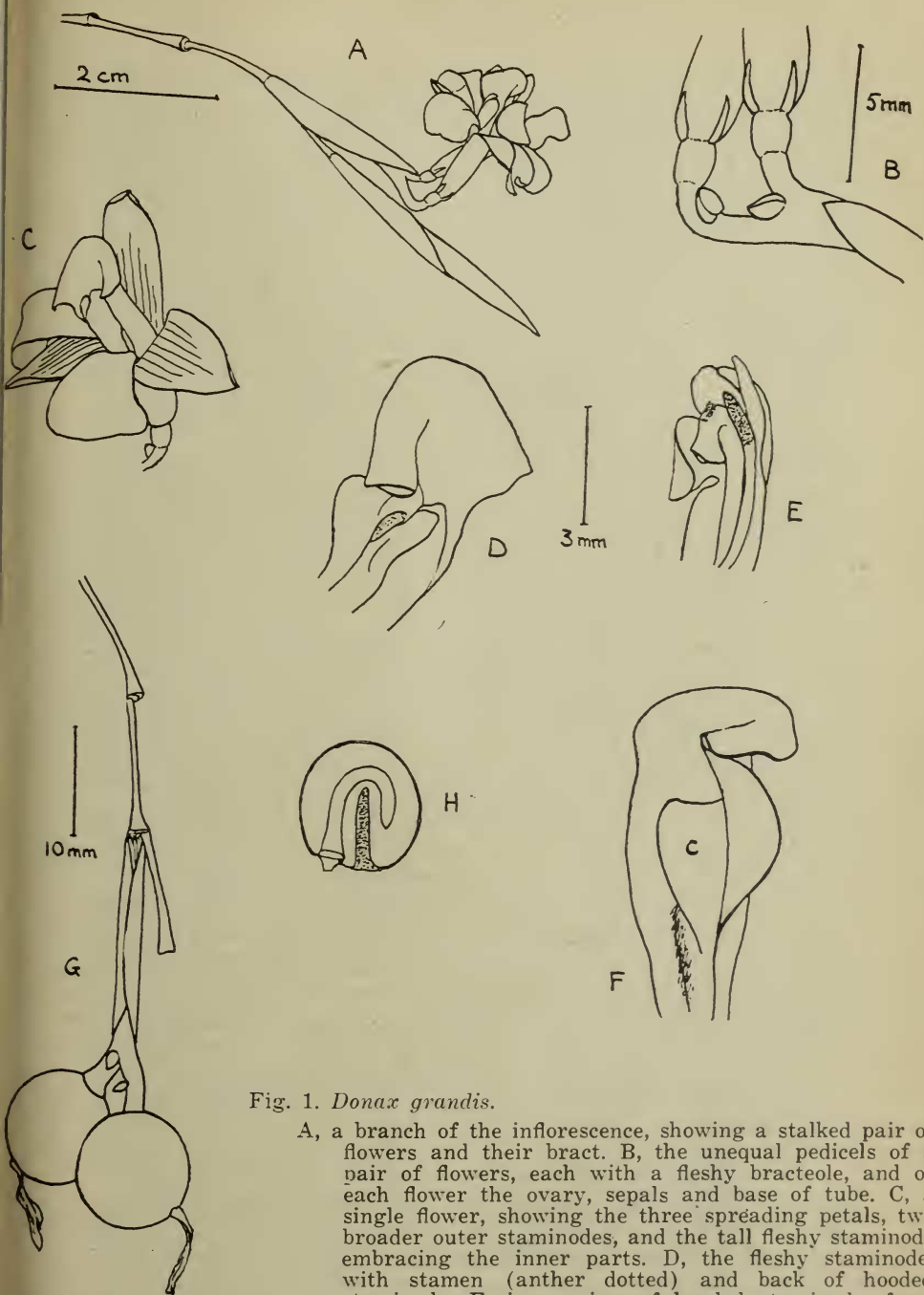


Fig. 1. *Donax grandis*.

A, a branch of the inflorescence, showing a stalked pair of flowers and their bract. B, the unequal pedicels of a pair of flowers, each with a fleshy bracteole, and of each flower the ovary, sepals and base of tube. C, a single flower, showing the three spreading petals, two broader outer staminodes, and the tall fleshy staminode embracing the inner parts. D, the fleshy staminode, with stamen (anther dotted) and back of hooded staminode. E, inner view of hooded staminode, from which the down-curved stigma has escaped; anther and its appendage in front on right. F, fleshy staminode of the other flower, being a mirror image of that shown in D; callus is marked C. G, a pair of fruits; persistent bract embraces their common stalk. H, longitudinal section of seed, showing curved embryo and perisperm canal.



staminodes, basal part of callus hairy. *Hooded staminode* 9 mm. long, yellowish, with a broad lateral lobe. *Stamen* 8 mm. long, with a narrow petaloid appendage a little longer than the anther. *Fruit* on much thickened pedicel, smooth and shining, almost spherical, 1 cm. diameter or rather larger, indehiscent. *Seeds* usually two, sometimes 1 or 3, without aril; surface rugose.

This is the large species of *Donax* which is common in lowland forest throughout Malaya. It does not agree with Schumann's description of *Donax arundastrum* Lour. from Indo-China, and Ridley was probably right in identifying it with Miquel's Sumatran species, though I have seen no authentic specimen of the latter. The two chief points of difference between *D. grandis* of Malaya and *D. arundastrum* are the large leaves with very broad base and the usually 2-seeded fruit of *D. grandis*, as against the smaller elliptic leaves and invariably 1-seeded fruit of *D. arundastrum*. The latter characters are given by Schumann for his *Actoplanes canniiformis* (based on *Thalia canniiformis* Forst., type from the New Hebrides), and indeed Gagnepain gives *A. canniiformis* as a synonym of *D. arundastrum*. If the species of Loureiro and of Forster are identical, *canniiformis* is the older name and should replace *arundastrum*. The largest Peninsula specimens have leaves strikingly larger and different in shape from any I have seen from outside Malaya, except a few from Sumatra, which agree exactly. It seems likely therefore that our species is found only in Malaya, Sumatra and perhaps in Borneo. It is however so nearly allied to *D. canniiformis* (or *D. arundastrum*) that some may prefer to unite the two and regard the species as distributed from Burma and Indo-China through Malaysia to the islands of the Pacific.

The dimensions of flower-parts given above are from a living plant in the Singapore Botanic Gardens.

2. *Donax parviflora* Ridl., J.S.B.R.A.S. 53: 59. 1910. Flora 4: 287.

*Habit* of *D. canniiformis* but smaller. *Leaf-blade* c. 10 by 5.5 to 20 by 9 cm., nearly elliptic, apex shortly acuminate, base broadly cuneate to rounded, lower surface with stiff hairs on either side of midrib: *petiole* 1.2–1.8 cm. long, with short stiff hairs on upper surface; *sheaths* to c. 12 cm. long. *Inflorescence* with several branches; internodes between primary bracts c. 8–11 mm. long. *Primary bracts*

c. 1.7–2.1 cm. long. *Common pedicel* of pair of flowers. 1.5–2 cm. long. Individual pedicels c. 2 and 5 mm. *Flower* without ovary c. 1 cm. long. *Ovary* silky-hairy. *Sepals* 2.5 mm. long. *Corolla-tube* shorter than sepals, lobes 8–9 mm. long. *Fruit* c. 1 cm. diameter, nearly round, smooth with sparse hairs, 1- or 2-seeded, seeds as in *D. canniformis*.

This species is nearly related to *D. canniformis* but as pointed out by Ridley differs in the much smaller flowers as well as in smaller size of plants. The corolla-tube is also shorter than the calyx, not longer as in *D. grandis*. No good flowers are available, so that a comparison of the other parts is not possible.

*D. parviflora* is only known from Malaya and Sumatra (specimens in Singapore herbarium).

SPECIMENS. *Pahang*: K. Tembeling, Ridley 2402. Pulau Tawar, Ridley 2401. Pasir Loyang, Ridley s.n. 7.7.1891. *Kelantan*: Kota Bahru, Ridley s.n. February 1917. *Perak*: Ipoh, Ridley 11931. *Selangor*: Batu Caves, Ridley 13393 (lectotype).

### SCHUMANNIANTHUS GAGNEP.

*Vegetative habit* similar to that of *Donax*. *Inflorescence* simple or with one branch only. *Corolla-tube* much shorter than calyx (one lobe only is free almost to base of flower); lobes much longer than tube. *Tube of staminodes* much longer than corolla-tube. *Fruit* dehiscent, 3-celled. *Seeds* 1–3, arillate.

The history of this genus is explained under *Donax*, as due to an error by Schumann in interpreting Loureiro's *Donax arundastrum*. The type species of *Schumannianthus* is also the type species of *Clinogyne* Salisb., and if that genus should prove valid, then it is the correct one for our species. *Schumannianthus* has however been accepted by Merrill and other authors and is here accepted also, but I have not seen Salisbury's publication.

*Schumannianthus* is a genus of two species, *S. dichotomus* and *S. virgatus*. The latter occurs in Ceylon and southern India, the former in Burma, Indo-China and Malaysia.

The main distinction between *Schumannianthus* and *Donax* is in the fruit, which is dehiscent in one but not in the other. This appears a valid generic distinction, though certainly the two genera are nearly allied. There is also a difference in the flowers, the stamen-tube being greatly elongated in *Schumannianthus* but not in *Donax*.

As regards dehiscent and indehiscent fruits in Marantaceae, Schumann points out that in the former the seeds are arillate but not in the latter. The aril sometimes serves as a spring to aid the dehiscence of the fruit. In *Schumannianthus dichotomus* the aril is curiously coiled and flattened; whether it can act as a spring in the same way as the aril of *Calathea* figured by Schumann is unknown.

***Schumannianthus dichotomus* (Roxb.) Gagnep., Bull. Soc. Bot. Fr. 1904: 176. Fl. Gen. Indoch. 6: 122. *Clinogyne dichotoma* Salisb., Trans. Hort. Soc. 1: 276. 1812. Bak., F.B.I. 6: 258. 1892. *Phrynium dichotomum* Roxb., Asiatic Res. 11: 324. 1810. *Donax arundastrum* sensu Schum., Pflanzenr. Marant. 33. 1902. et Ridl., J.S.B.R.A.S. 32: 177; Flora 4: 286; non Loureiro.**

*Branching* as in *Donax arundastrum* but main stems shorter; whole plant c. 1.5 to 2.5 m. tall. *Leaf-blade* c. 10–15 cm. long and to 6.5 cm. wide, elliptic, apex acute (hardly acuminate), base rounded or broadly cuneate, both surfaces glabrous; *petiole* 5–8 mm. long, short-hairy; *ligule* c. 2 mm. long; *sheath* 6–11 cm. long. *Inflorescence* to c. 30 cm. long, simple or sometimes with one branch near the base; internodes c. 1.5–2 cm. long. *Primary bracts* c. 3.5–4.2 cm. long; 2-keeled bracts c. 2 cm. long. *Common pedicel* of pair of flowers c. 2.5 cm. long; individual pedicels c. 2–3 mm. and 8–12 mm., bracteoles fleshy, 3 mm. long. *Total length of flower* c. 4 cm., the whole white except for yellow on staminodes. *Sepals* c. 6–7 mm. long, narrow, faintly pinkish. *One corolla-lobe* free almost to base of flower, the others joined together and to staminodes for a length of 10 mm., distal halves of all lobes spreading; free corolla-lobe c. 2.7–3 cm. long and 5–7 mm. wide, widening from a narrow base, blunt. *Tube of staminodes* c. 2.4 cm. long; outer staminodes c. 2.3 cm. long and 10 mm. wide; inner much shorter; stamen c. 5 mm. long. *Fruit* more or less hairy, widening upwards from the base, 3-lobed, dehiscent; c. 1.2 cm. long. Seeds 1–3; aril present, consisting of two long narrow lobes which are coiled and flattened to form a cup round the base of the seed.

This species is distributed from Burma to Indo-China and widely in Malaysia. In Malaya it is found throughout the country in swamps and by rivers, 'forming thickets in the water' (Ridley). It has a habit similar to that of *Donax grandis* but is smaller, and is easily recognized by its smaller

leaves, inflorescences with longer bracts and larger flowers and its dehiscent fruits of distinctive shape. Malays recognize the similarity of the two species by calling the present one *Bemban ayer* (water Bemban).

### STACHYPHRYNIIUM K. SCHUM. (Emend.)

*Erect shoots* very short, bearing 2 or 3 leaves. *Leaves* small to large, on relatively long petioles. *Inflorescence* terminal on a leaf-shoot, sometimes with a leaf on the peduncle, or on a separate shoot bearing bladeless sheaths only at the base; peduncle short or long; flower-bearing portion a simple unbranched spike of few to many distichous bracts. *Flowers* 1-5 pairs in the axil of each bract, each pair of flowers with a 2-keeled prophyll, mesophylls sometimes also present, apparently all 2-keeled. *Sepals* short and narrow, equal. *Corolla-tube* longer than the sepals. *Outer staminodes* 2, obovate from a narrow base, usually about as long as the petals. *Inner staminodes* shorter. *Fruit* dehiscent, usually 2-seeded; seeds with bilobed deflexed aril.

This genus was founded by Schumann in his Pflanzenreich monograph, to comprise those species, formerly included in Phrynium, which had a simple spike, in contrast to the much-branched inflorescences usual in Phrynium. He further stated that Stachyphrynium had 2-ranked bracts (in Phrynium they are spirally arranged), one pair of flowers to each bract and no mesophylls. But examination of specimens show that the two latter characters are incorrect. Not only has *S. Griffithii* up to 5 pairs of flowers (as Schumann himself realized), but 2 pairs with a rudiment of a third occur in *S. Jagorianum*; and in *S. Griffithii* there are quite large mesophylls present. The only real distinction from Phrynium then lies in the distichous bracts; for there are species of Phrynium which have a simple unbranched spike.

Then we have also the consideration that *S. Griffithii* (and probably also *S. latifolium* from Java) has the inflorescence on a separate shoot, as well as possessing mesophylls, in both differing from *S. Jagorianum*. Should this constitute a generic distinction? If so, we have to divide Stachyphrynium into two parts, and make a new genus for *S. Griffithii* and its allies. In what genus then shall we place the unnamed species herein briefly described? It has a terminal inflorescence *with mesophylls* present.



On the other hand, the genus *Calathea* includes species with distichous and with spiral bracts. If it is possible to include species so differing in a single genus, why not re-unite *Stachyphrynium* to *Phrynium*? With the few species at my disposal, I do not feel able to come to a satisfactory decision on the matter, but my inclination is to revert to a large genus *Phrynium*. If this is not done, I suggest that the present *Stachyphrynium* should be subdivided.

## KEY TO MALAYAN SPECIES OF STACHYPHRYNIUM

Inflorescence terminal on the leaf-shoots

Peduncle without a leaf attached to it, usually short; inflorescence of about 4 bracts; no mesophylls

1. *S. Jagorianum*.

Peduncle c. 18 cm. tall with a leaf near the apex; spike with many more bracts; mesophylls present

2. *Stachyphrynium* sp.

Inflorescence on separate shoots bearing bladeless sheaths only

Bracts with spreading ends, forming pouches; greatest width of inflorescence including bracts 3.5 cm.

3. *S. Griffithii*.

Bracts with ends hardly spreading; inflorescence 1.2–1.5 cm. wide (wider when fruiting)

4. *S. cylindricum*.

1. ***Stachyphrynium Jagorianum*** (K. Koch) K. Schum., Pflanzenr. Marant. 48. 1902. Ridl., Flora 4: 288. *Phrynium Jagorianum* K. Koch., Berl. Wochenschr. 6: 358. 1863. Ridl., J.S.B.R.A.S. 32: 179.

*Leafy shoots* bearing 2 or 3 leaves and a terminal inflorescence. *Leaf-blade* commonly to about 17 by 5 cm., sometimes to 20 by 8 cm. (or larger ?), nearly oblong with a broadly cuneate to rounded base and abruptly short pointed apex, usually short-hairy on lower surface of midrib and lamina, upper surface with oblique bars of darker green; *petiole* thickened part to about 1 cm. long, rest 10–20 cm. or more, slender; *sheath* to about 10 cm. long. *Peduncle* of inflorescence usually about 1 cm. long, exceptionally to 15 cm. (?). *Spike* of about 4 distichous bracts c. 2 cm. long, glabrous, acute. *Flowers* small, white, 1 or 2 pairs to each bract, each pair with a 2-keeled bracteole; no other bracteoles. *Sepals* 3 mm. long. *Corolla-tube* 1.7 cm. long, lobes 9 mm. long. *Outer staminodes* unequal,

the larger obovate, 9 mm. long. *Inner staminodes* c. 5 mm. long, yellow at apex. *Capsule* about 1.2 cm. long, 2-seeded; seeds oblong, brown, smooth, rounded on one face and flat on the other, with 2-lobed red aril.

This species was described from a plant cultivated in Germany, sent from Malaya. It appears to be locally abundant in half-shady places, not in primary forest, but does not flower freely (or the flowers have not been seen), which perhaps explains why it has been collected few times. The inflorescence is usually right at the base of the plant; but two specimens which otherwise seem similar have it on a slender peduncle, in one case 7 cm. in the other 16 cm. long. The dimensions of the parts of the flower are taken from Schumann. The dried flowers on Ridley's Dusun Tua plants seem rather smaller, but this may be due to shrinkage on drying. Schumann states that there is only one pair of flowers to each bract; I have found two, with rudiments of a third, on the only two specimens showing good flowering material.

**SPECIMENS.** *Perak*: Sungei Kulim, S.F.N. 13807 (Burkill and Haniff). *Grik*, S.F.N. 13626 (Burkill and Haniff; sterile). *Penang*: Pulau Boetong, Curtis 2523. *Trengganu*: Kuala Telumong, Holtum s.n. 13.5.1925. *Pahang*: Pelangai, S.F.N. 16773 (Burkill and Haniff). *Selangor*: Dusun Tua, Ridley 7793. Batu Caves Estate, Ridley s.n. 1896. *Negri Sembilan*: Tampin-K. Pilah Rd., S.F.N. 2813 (Burkill).

## 2. *Stachyphrynium* sp.

*Erect shoots* bearing 2 or 3 basal leaves and another leaf on the peduncle below the inflorescence. *Leaf-blade* about 30 by 12 cm., base broadly rounded; petiole and sheath of leaf accompanying inflorescence 35 cm. long, the sheath 7.5 cm. *Inflorescence* a simple spike; peduncle 18 cm. from base of plant, the leaf attached at a height of 14 cm., leaving a free peduncle of 4 cm. below the spike. *Spike* c. 10 cm. long. *Bracts* c. 3 cm. long, short-hairy towards the tips, tips broad, shortly apiculate, not very soon breaking down to a fibrous condition. *Flowers* 2-3 pairs to each bract. *Sepals* apparently c. 8 mm. long.

This species is represented by a single specimen collected by Ridley at Temango in Perak (s.n., July 1909). He referred it to *Phrynium Jagorianum* but it is much larger than that species and differs in the long-stalked inflorescence and the presence of mesophylls.

The flowers are not well enough preserved to show details and it is impossible to say whether one or two outer staminodes are present.

In the distichous bracts and presence of mesophylls this species agrees with *Stachyphrynium Griffithii*; but it has a terminal inflorescence on the leaf-shoot. It adds another combination of characters to the already rather heterogeneous *Stachyphrynium*, but seems best placed in this genus pending further information, on account of its simple spike of distichous bracts. When a decision on the status of *Stachyphrynium* is made, it may be necessary to remove this species to another genus.

3. *Stachyphrynium Griffithii* (Bak.) K. Schum., Pflanzenr. Marant. 49. 1902. Ridl., Flora 4: 287. *Phrynium Griffithii* Bak., F.B.I. 6: 260. 1892. Ridl., J.S.B.R.A.S. 32: 178. *Phrynium spicatum* Griff., Notul. 3: 408. 1851, (not of Roxb.). *Hitchenia musacea* Bak., F.B.I. 6: 225. 1892. Fig. 2.

*Habit* tufted, 2-3 leaves to each shoot, stems of shoots very short. *Leaf-blade* 35 by 10.5 to 55 by 16 to 65 by 26 cm., narrowly ovate, the basal 2-3 cm. narrowly cuneate, widening abruptly to a broadly rounded base, then very gradually to the rounded and very shortly acuminate apex, surfaces glabrous, upper dark green with paler broadly channelled midrib, lower slightly glaucous with strongly raised yellow-green midrib; thickened apical part of petiole c. 7-9 cm. long, rest of petiole to c. 100 cm. long, not grooved; *sheath* to c. 45 cm. long; no evident ligule. *Inflorescence* on a separate branch from base of plant, its base protected by several 2-ranked sheaths, the longest c. 10-15 cm. long. *Scape* 5-20 cm. long, glabrous, pale green and shining. *Spike* 12-20 cm. long with up to c. 18 distichous bracts, total width including the spreading apices of the bracts c. 3.5 cm. *Bracts* pale green to buff, c. 3.5-4 cm. long (lowest often longer), 4 cm. wide when flattened, their sides closely overlapping, the apical  $\frac{1}{4}$  curved outwards and forming an open pouch, the apex broadly rounded and very shortly tipped. *Flowers* to 5 pairs in axil of each bract, each pair of flowers protected by a 2-keeled bract to 2 cm. long; broad mesophylls also present; flowers white, fragrant. *Sepals* 5-6 mm. long, narrow. *Corolla-tube* slender, widened near top, nearly 3 cm. long; lobes rolled

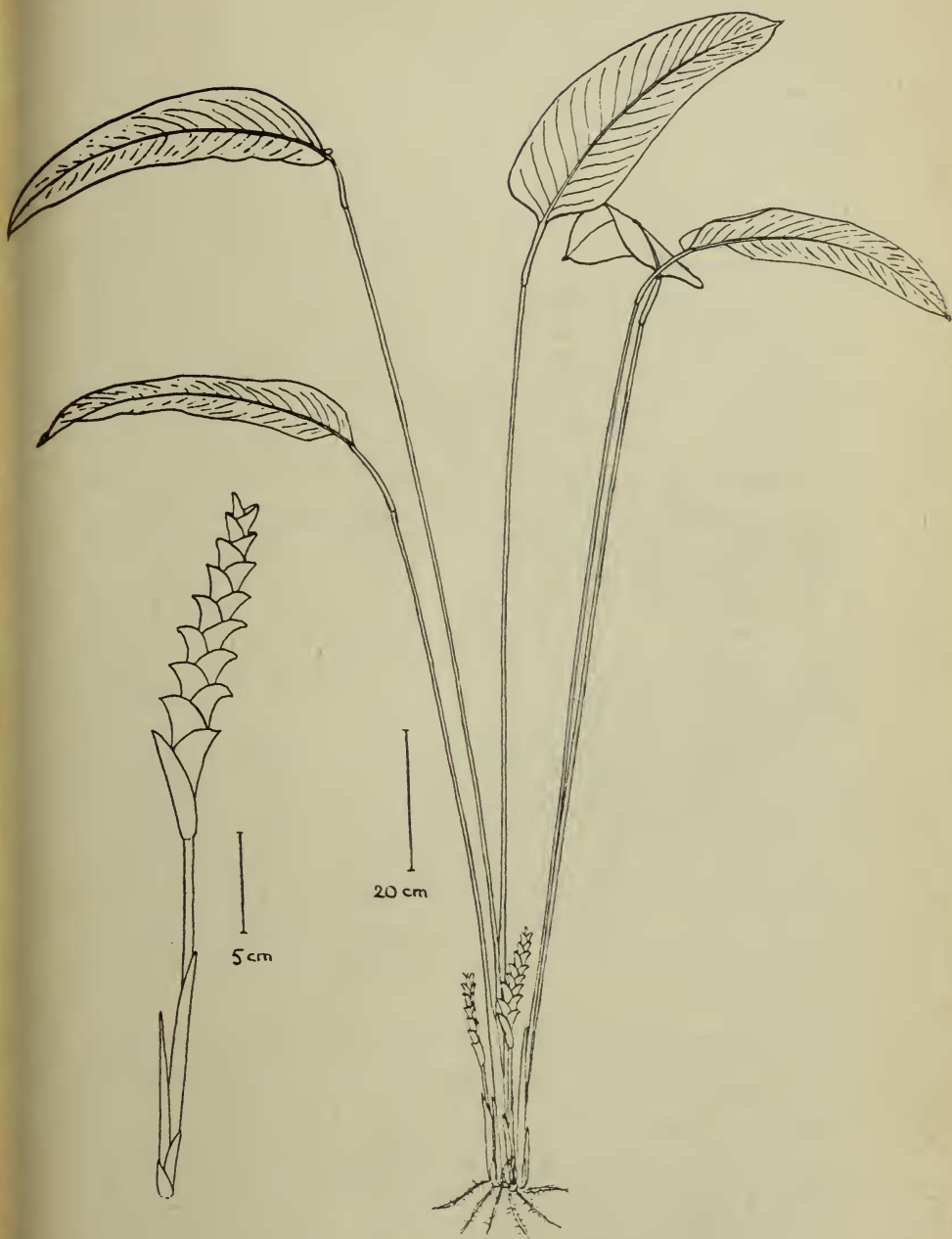


Fig. 2. *Stachyphrynium Griffithii*.

A flowering plant; on the left, an old inflorescence.



back, c. 12 mm. long, 4.5 mm. wide near base, tapering to blunt apex. *Outer staminodes* broadly obovate, the larger one 12 mm. long, 9.5 mm. wide, the smaller 6.5 mm. wide. *Fleshy staminode* white, 7.5 mm. long, glabrous except for a hairy white keel near the base. *Hooded staminode* as long, white with yellow edge. *Anther* attached half-way down one edge of the fleshy staminode, the smaller outer staminode attached at the same place. *Petaloid appendage* attached only to the anther itself, for rest free, standing beside the hooded staminode and similar in form and colour but smaller (when flattened c. 7 by 2 mm.). *Fruit* c. 2.3 cm. long (Ridley), bilocular, seeds rugose with a white aril.

This species is only known from Malaya. It has been collected at many localities in lowland forest from Singapore northwards to Perak and Pahang, and is often abundant. The floral details given by Schumann are copied from Ridley and are inaccurate. The petiole has six lacunae as seen in transverse section; these lacunae pass throughout the length of the petiole, being closed by thin transverse walls c. 8–10 mm. apart.

*Phrynium latifolium* Bl. from Java is very closely allied. It is described by Schumann as having a 'radical' inflorescence. Koorder's rather crude figure shows the bracts somewhat different in shape from *S. Griffithii* but may be inaccurate. I have seen no specimens.

It is evident that Schumann never dissected an inflorescence of *S. Griffithii*; nor I suspect one of *S. latifolium*. The mesophylls are very large and conspicuous, whereas he stated that they were absent in this genus (and in *Phrynium* also!). The prophylls seen by me are all bicarinate; none showed signs of a middle keel. They appear not always to be in a strictly regular series, but lateral displacements are irregular and perhaps only due to unequal growth of pairs of flowers.

4. *Stachyphrynium cylindricum* (Ridl.) K. Schum., Pflanz.-enr. Marant. 49. 1902. Ridley, Flora 4: 287. *Phrynium cylindricum* Ridl., J.S.B.R.A.S. 32: 178. 1899.

*Habit* of *S. Griffithii*, with leaves of similar size and shape. *Inflorescence*: scape to 28 cm. long, spike to 28 cm., similar to that of *S. Griffithii* but narrower, the tips of the bracts spreading very slightly, total width about 1.2–1.5 cm. except in fruiting specimens. *Sepals* c. 8 mm. long, tinged with red-brown. *Corolla-tube* slender, c. 2.5 cm. long,

lobes shorter (2 cm. long ?). *Outer staminodes* with narrow base and broad more or less round blade of irregular shape, longer than the corolla-lobes. *Inner staminodes* and stamen about half as long as the outer staminodes, tipped with yellow. *Fleshy staminode* hairy on the thickened part. *Fruit* ellipsoid, flattened, 1.5 cm. long, 2-seeded: seeds with bilobed deflexed aril.

This species appears to grow only on limestone in the north of Malaya. It was introduced to cultivation in Singapore and a coloured drawing was made, from which the above floral details are taken. Unfortunately there is no indication as to the size of the flower except Ridley's statement that the corolla-tube is 1 inch long ( $\frac{1}{4}$  inch in original description, but this probably applies to the sepals). Ridley's dimensions are in all cases very uncertain.

*S. cylindricum* is very closely related to *S. Griffithii*; to what extent the two differ in floral details is uncertain.

**SPECIMENS.** *Perak*: Kuala Dipang, Ridley 9787. Ipoh, foot of limestone hill, Curtis, 3318. Tambun, limestone cliffs, S.F.N. 6296 (Burkill). *Kelantan*: Bukit Tumangan, S.F.N. 10258 (Haniff and Nur). *Kedah*: G. Baling, on limestone, S.F.N. 35410 (Kiah).

### PHRYNIUM WILLD.

*Erect shoots* close together, bearing about 1–4 long-petioled leaves close to the base and a terminal inflorescence, the inflorescence sometimes accompanied by a leaf attached to the axis of the shoot much higher than the others. *Leaf-blade* more or less elliptic, sometimes variegated above and sometimes purple beneath, small to large. *Peduncle* of inflorescence either very short or of moderate length without a leaf; or nearly as long as the petioles of the basal leaves, bearing a similar leaf (but short-stalked) near its apex, the inflorescence protected when young by the sheath of this leaf, the petiole of the leaf in the same vertical line as the peduncle. *Inflorescence* consisting at first of a simple spike, bearing other spikes in the axils of its basal bracts, and then again often spikes of a second and third order, so that the whole is a compact group of many small spikes, usually spreading laterally or obliquely from the sheath of the accompanying leaf and thus appearing to arise on the side of the leaf-stalk; or sometimes the original spike remaining simple or with few secondary spikes. *Bracts* always spirally arranged, nearly always breaking down near the apex (and sometimes to the base when old) into

an irregular group of fibres; two to several pairs of flowers in the axil of each bract, the flowers protected by prophylls and usually also mesophylls; first prophyll 2-keeled, subsequent prophylls of the same partial inflorescence 3-keeled. *Flowers* white or partly purple, pedicelled or not. *Sepals* usually fairly long and persistent. *Outer staminodes* two, often unequal. *Fruit* dehiscent, usually 3-seeded, the pericarp tough or woody, smooth or rough. *Seeds* with short or long 2-lobed basal aril.

The type-species of Phrynium is *P. capitatum* Willd., with which I believe *P. malaccense* Ridl. to be identical, one of the commonest species of Marantaceae in Malaya. This has a very compound and compact, almost spherical inflorescence, of many separate short spikes, which projects almost horizontally, apparently from the axil of the leaf which stands erect on the end of the peduncle (for which reason the older books state 'lateral on the side of a petiole'). The inflorescence itself is of course terminal, the leaf being lateral, but the leaf assumes an erect position, continuing the line of the axis, and the inflorescence which grows out from the protection of its sheath must turn to one side.

This is the commonest type of inflorescence in Phrynium. A modification of it is found in *Phrynium tristachyum*, in which the individual spikes are fewer and longer, and in the unnamed species, which appear always to have a simple spike only.

If we reduce the length of the internode between the inflorescence-leaf and the basal leaves, and then extend the axis (peduncle) above that leaf, we have an apparently free-stalked inflorescence, which has room to spread in all directions equally and so looks very different from *P. capitatum* though essentially the same; such is *P. terminale*.

Schumann makes a curious mistake in his diagnosis of the genus Phrynium. He states that there are no mesophylls; but they occur in all our species. He also states that 3-keeled prophylls only occur in Phacelophrynium and Calathea, not in Phrynium; but again they occur in all our species. The middle keel however varies much in development in different prophylls of the same inflorescence. In some species it is very broad.

At present eight species of Phrynium are known in Malaya. Of these, two are here described for the first time, one of them only being named, material of the second being

insufficient for a full description. Details of the flower are still lacking in the case of two other species (*P. parvum* and *P. tristachyum*). The flowers of *P. terminale* are here described for the first time and new data given for the flowers of the other species also.

## KEY TO MALAYAN SPECIES OF PHRYNIUM

Inflorescence apparently lateral, emerging from the sheath of an apparently terminal leaf

Inflorescence of a single simple spike 1. *Phrynium* sp.

Inflorescence with at least one, often many subsidiary spikes

Small plants; inflorescence about 3 cm. long with one or two subsidiary spikes only

Petiole of leaf accompanying inflorescence 2.5–5 cm. long; inflorescence sessile in the leaf-sheath 2. *P. gracile*.

Petiole of leaf accompanying inflorescence 15 cm. or more long; inflorescence on a stalk to 3 cm. or more long beyond the sheath 3. *P. parvum*.

Larger plants; inflorescence longer, usually with many spikes

Inflorescence of 2–4 spikes, the longest c. 10 cm. long 4. *P. tristachyum*.

Inflorescence of many spikes forming a compact head

Fruit maroon, shining; flowers partly purplish; basal sheath of inflorescence not very hairy; leaves pale silver-green beneath 5. *P. capitatum*.

Fruit dull, not maroon; flowers white; basal sheath of inflorescence long and very hairy; leaf red beneath

6. *P. hirtum*.

Inflorescence terminal on a short or long peduncle, not accompanied by a separate leaf

Inflorescence nearly spherical, 7 cm. diameter, hairy, very near the ground, on a short peduncle, appearing among the bases of the leaf-sheaths

7. *P. basiflorum*.

Inflorescence much smaller, not hairy, raised on a slender peduncle



Peduncle 25–35 cm. long; inflorescence 6–7 cm. long, with about 7–8 spirally arranged broad bracts

8. *P. terminale*.

Peduncle c. 8–16 cm. long; inflorescence c. 4 cm. long, with first two (largest) bracts alternate

3. *P. parvum*.

### 1. *Phrynium* sp.

*Erect shoots* bearing 2–3 leaves and 2 long bladeless sheaths at the base, and one leaf accompanying the inflorescence at the top of the peduncle. *Leaf-blade* 30 by 7 to 40 by 12 cm., elliptic but more narrowed to the acuminate apex than to the base, base rather broadly cuneate and slightly decurrent, surfaces glabrous, upper surface pale green with darker veins, lower surface pale silvery-green; petiole of basal leaves to 100 cm. long (including sheath) the thickened part 1.5–3.5 cm. long; petiole and sheath of leaf accompanying inflorescence 6–18 cm. long. *Peduncle* of inflorescence to c. 70 cm. long. *Inflorescence* sessile at point of attachment of leaf, 6–8 cm. long, apparently always a simple unbranched spike with spirally arranged bracts. *Bracts* 2–2.5 cm. long, green, the apical part soon turning brown and splitting into fibres, each with a few pairs of flowers in the axil; mesophylls present. *Pedicels* c. 1 mm. long. *Ovary* 3 mm. long, hairy. *Sepals* c. 1.3 cm. long. Rest of flower, and fruit, not seen.

This species is only known from a single collection from Kemaman (Trengganu) where Corner saw it at two localities and thought it probably common. It resembles *P. tristachyum* in the shape of the spikes, but these appear always to be quite simple. The leaf also has a much narrower apex than in *P. tristachyum* and is never large. It does not agree with any description I have seen, nor with any specimen in the Singapore herbarium.

SPECIMENS. *Trengganu*: Bukit Kajang, Kemaman, 700–1,000 feet, S.F.N. 30397 (Corner).

### 2. *Phrynium gracile* Holtt., sp. nov.

Laminae foliorum ad 18 cm. longae et 6 cm. latae (interdum  $15 \times 6$  cm. interdum  $18 \times 3.5$  cm.), lanceolatae, apicem versus sensim angustatae, basi rotundatae deinde cuneatae; supra atrovirides, lineis pallidis obliquis ornatae; infra pallide virides, prope costam leviter hirsutae; petioli foliorum basium ad 45 cm. longi (vagina inclusa), omnino breviter hirsuti, interdum glabrescentes; geniculum 1–2 cm.

longum; vaginae latae, arcte imbricatae, ad 24 cm. longae. Inflorescentia sessilis, in juventute vagina folii proprii obtecta; petiolus cum vagina folii obtegentis 2.5-5 cm. longus. Inflorescentia simplex, c. 3 cm. longa, vel spica altera in axilla bractae infimae aucta. Bractae 1.2-1.5 cm. longae, apicem obtusum versus dense et breviter pilosae, apex demum leviter marcescens. Flores 1-3 pares in axilla bractae quaeque; prophyllum primum bracteam leviter superans; mesophylla adsunt. Pedicellus cum ovario 3 mm. longus; ovarium hirsutum. Sepala 7-8 mm. longa; tubus corollae 1 cm. longus, lobi 4.5 mm. longi, 2 mm. lati, oblongi; staminodia exteriora inaequalia, majus fere lobos corollae aequans; staminodium carnosum c. 2 mm. longum (2.5 mm. ?); staminodium cucullatum c. 2.5 mm. longum; stamen c. 2.5 mm. longum, appendiculus petaloideus angustus, adnatus. Fructus non visus.

TYPUS: S.E. Johore, locus certus ignotus, S.F.N. 29981 (leg. Corner).

This species is represented only by two collections from Johore. It is similar in size to *P. parvum* but differs (1) in the inflorescence always with an accompanying leaf, without peduncle above the leaf, (2) in the lower bracts being spirally arranged and not nearly as long as the whole inflorescence, (3) in the hairy bracts with blunt apex, (4) in the pale stripes on the upper surface of the leaf. There are no colour notes on the flowers, which are above described from a dried specimen only.

The second specimen is an unnumbered one from Sungei Kayu Ara, Sedili, Johore, collected by Corner on 28th June, 1936.

A specimen from Tiang Laju, Sarawak (Hewitt 24) is very similar vegetatively to the Johore specimens of *P. gracile*, but the inflorescences are in such poor condition that its identification with *P. gracile* is uncertain. It bears the note 'flowers white with red markings near the throat.'

3. *Phrynium parvum* (Ridl.) comb. nov. *Stachyphrynium parvum* Ridl., J.S.B.R.A.S. 54: 60. 1909. Flora 4: 288. *Stachyphrynium minus* Ridl., Mat. Fl. M.P. 2: 59. 1907 (non Schum.). Fig. 3.

*Erect shoots* bearing about 3 leaves near the base and a terminal inflorescence on a slender peduncle, sometimes

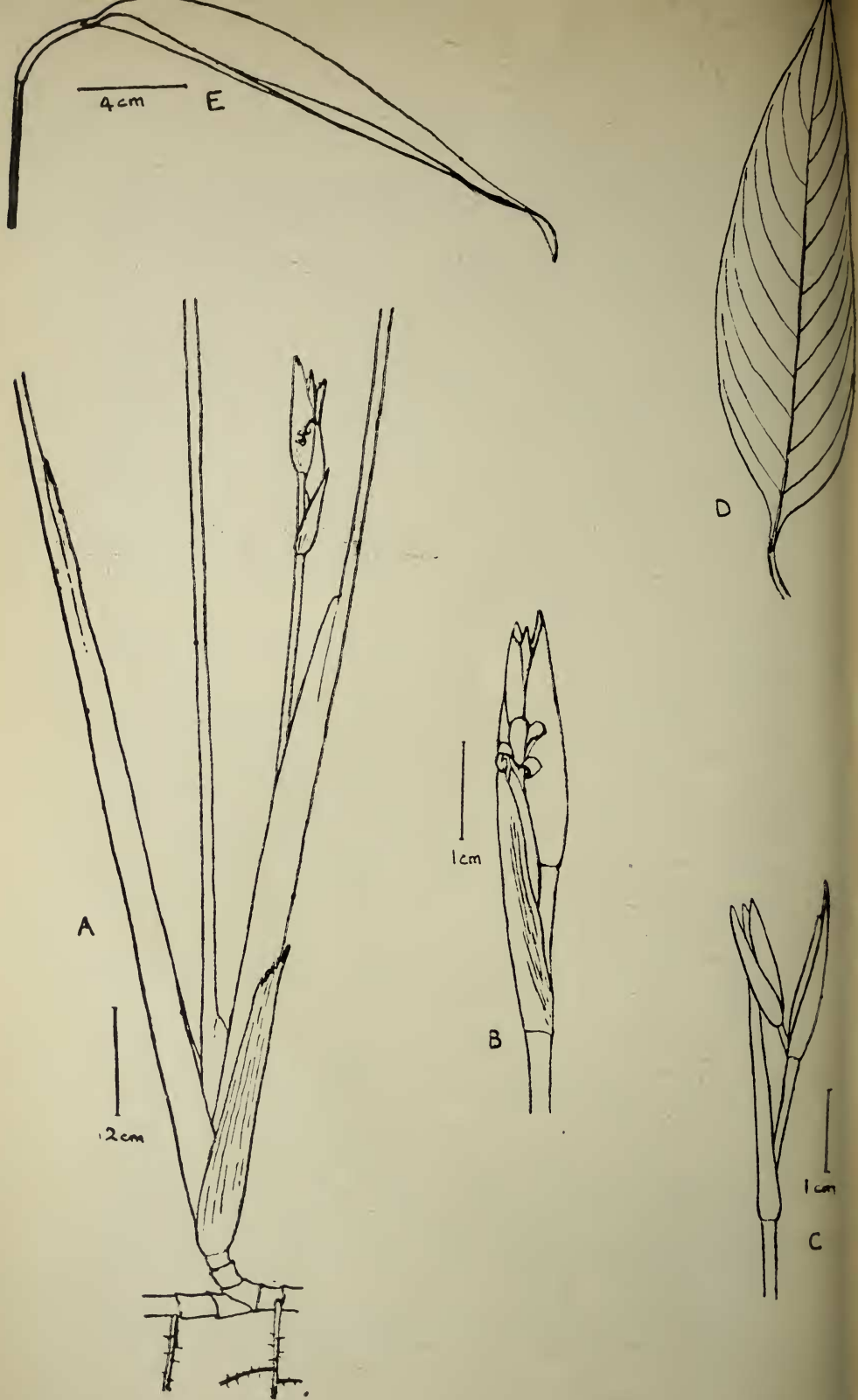


Fig. 3. *Phrynium parvum*.

A, rhizome bearing a leafy shoot which has a sheath, 3 leaves and an inflorescence. B, inflorescence with flower on branch in axil of basal bract; flower shows 2 petals and 2 erect outer staminodes. C, inflorescence of which the apical part has finished flowering; branch in axil of second bract (on right) now active; branch in axil of lowest bract not yet developed. D, shape of leaf, flattened. E, leaf in natural position.

(rarely ?) with a leaf at the apex of the peduncle. *Leaf-blade* c. 14 by 3·5 to 24 by 5·5 cm., widest about  $\frac{1}{4}$  from the broadly cuneate base, narrowed very gradually to the acuminate apex; upper surface dark green, shining, lower surface pale, with fine darker veins, finely hairy on the midrib; *petioles* to about 40 cm. long including sheath, thickened upper part of petioles c. 2 cm. long, *sheath* to about 15 cm. long (shorter on inner leaf), glabrous. *Peduncle* of inflorescence c. 8–16 cm. long. *Inflorescence* to about 4 cm. long; first bract almost as long as whole inflorescence, separated by an internode of 1–2 cm. from the second bract, and this by 4–5 mm. from the third; first and second bracts with axillary secondary inflorescences which develop after the terminal inflorescence. *Bracts* slightly reddish when young, apiculate, slightly hairy near the tip, thin and breaking when old, not producing groups of fibres; flowering bracts to about 1·7 cm. long (first two bracts longer), about 3 in each partial inflorescence, all reaching the same height. *Flowers* 2 pairs to each bract (members of a pair opening separately), with prophylls and mesophylls, the outer ones as long as the bract. *Ovary* 2 mm. long, hairy. *Sepals* 7 mm. long, very narrow. *Corolla-tube* white, 1·5 cm. long; lobes c. 6 by 2·5 mm., reflexed, blunt, slightly yellowish. *Outer staminodes* 2, erect, obovate, concave, white, about 5 by 3 mm. *Fleshy staminode* 2·5 mm. long, truncate. *Hooded staminode* 4 mm. long, yellow-tipped. *Stamen* 4 mm. long, appendage hardly longer than anther and connate with it almost throughout.

This species was placed by Ridley in the genus *Stachyphrynium*, but its branched inflorescence is like *Phrynium*, though the first three bracts appear to be alternate, not spirally arranged (the flowering bracts in each partial inflorescence are spirally arranged). The terminal part of the inflorescence flowers first, then the secondary inflorescence in the axil of the second bract, then that in the axil of the first (basal) bract, and finally a tertiary inflorescence in the axil of the basal bract of the preceding.

In Ridley's type specimen, one inflorescence has a foliage leaf (with petiole 15 cm. long) replacing the basal bract, but this seems rare. No fruits are known.

*P. parvum* is abundant in the Reservoir Jungle in Singapore Island, but seems not to flower very freely. It



has also been collected in Johore (Ridley reports it from Sedenak as well as the specimen quoted below).

SPECIMENS. *Singapore*: Reservoir, Ridley 12565 (type); Corner s.n. 1944. *Johore*: North of G. Belumut, S.F.N. 10294 (Holtum).

4. *Phrynium tristachyum* Ridl., *Flora Mal. Penin.* 4: 290. 1924.

*Erect shoots* with single leaf only (?). *Leaf-blade* to about 60 by 25 cm., almost evenly elliptic with very shortly pointed apex and cuneate base, glabrous; *petiole* and sheath of leaf accompanying inflorescence 25–50 cm. long (of other leaves not seen), thickened upper part of petiole to 12 cm. long; *sheath* glabrous. *Peduncle* to 1.5 m. tall. *Inflorescence* sessile or nearly so at the base of the leaf-sheath, consisting of 2–4 separate spikes all radiating from the base of the inflorescence, the longest spike to 11 cm. long. *Bracts* about 3 cm. long, glabrous, soon breaking down in the apical half to a group of fibres and later split to the base in many segments. *Flowers* white, 3 pairs or more to each bract. *Prophylls* and *mesophylls* present. *Pedicel* of flower 2 mm. long. *Ovary* 4 mm. long, silky-hairy. *Sepals* c. 1.2 cm. long, narrow. *Corolla-tube* c. 8 mm. long. *Fruit* broadly ovoid, apex not retuse, surface rough and more or less hairy, slightly 3-lobed, c. 1.5 cm. long, dehiscent, with 1–3 seeds. *Seeds* ovate as seen from the back, narrowing to the apex (always ?), the surface mottled with red and black; aril 2-lobed, the lobes 7 mm. long or more (nearly as long as the seed when straightened).

Unfortunately no good flowers of this species are available. It is distinct in the rather few long spikes of the inflorescence, in the ovoid fruit with long aril-lobes of the seed, and in the large elliptic shortly tipped leaf. In the original collection are three long spikes and a short, fourth one, the four together spread in one plane, forming a fan-shaped arrangement. Other specimens have very old spikes which have the bracts so shredded that the inflorescence hardly has a definite shape, but even here the few rather long separate spikes (in contrast to the usual mass of small ones) are conspicuous.

No leaves except those bearing inflorescences have been collected. This may be because collectors thought other leaves unnecessary; but one sheet bears the note 'single leaf on each shoot', and another specimen, rather doubtfully of

this species, certainly has only one leaf on the erect shoot. This may therefore be a distinctive character of the species.

The species has been collected in Selangor, Negri Sembilan and Johore. Two field notes record it as abundant.

**SPECIMENS.** *Selangor*: Bukit Lagong, 11th mile Rawang Road from Kuala Lumpur, Foxworthy and Burkill s.n. 30.11.1921 (type). Dusun Tua, Ridley 7793 (p.p., rest being *Stachyphrynium Jagorianum*). *Negri Sembilan*: Ulu Bendul, S.F.N. 9995 (Holttum). *Johore*: Ulu Kahang, S.F.N. 10917 (Holttum).

5. *Phrynium capitatum* Willd., Spec. Pl. 1: 17. 1797. Schum., Pflanzenr. Marant. 53. *Phrynium malaccense* Ridl., J.S.B.R.A.S. 32: 180. 1899. Flora 4: 290. *Phrynium hirtum* Ridl., J.S.B.R.A.S. 32: 181; Flora 4: 289, p.p. Fig. 4.

*Erect shoots* bearing c. 3–6 leaves from the base and a terminal inflorescence at the apex of a long stem, with a short-stalked erect leaf just below the inflorescence. *Leaf-blade* from about 30 by 8–14 cm. to 60 by 15–25 cm. or even larger, elliptic with broad rounded base and very shortly acuminate apex, dark green and shining above with slightly prominent main veins, dull pale green (hardly glaucous) below, the fine evenly spaced veins darker, glabrous except for pale silky hairs on either side of midrib. *Petiole*: thickened part 5–10 cm. long, rest 100–200 cm. tall (in basal leaves) including sheath; sheath to 75 cm., its back more or less hairy, the two edges meeting at a narrow angle at the top, not forming a ligule. *Petiole* and sheath of leaf accompanying inflorescence c. 10–80 cm. long. *Peduncle* of inflorescence about same length as petioles of basal leaves, not prolonged beyond base of the leaf which it bears; sheath of leaf short and broad, usually hairy at least at the base and sometimes throughout, partly enclosing the inflorescence. *Inflorescence* spreading laterally from the base of the leaf-sheath, with many branches, ultimately forming an almost round head 5–10 cm. in diameter; first basal sheath of inflorescence 3–5 cm. long. *Branches of inflorescence* each with about 3–5 bracts; *bracts* ± hairy towards apex, green, ovate, acute, the apex soon turning brown and decomposing to a group of fibres, 2.5–3 cm. long, each enclosing 2–5 pairs of flowers: flowers of same pair not opening together. *First prophyll* 2-keeled, 2nd and 3rd 3-keeled, keels sometimes hairy. *First mesophyll* always present, later ones sometimes absent (?). *Pedicels* of individual flowers to about 6 mm. long. *Ovary* more or less densely silky-hairy, 3–4 mm. long. *Sepals* narrow, more or

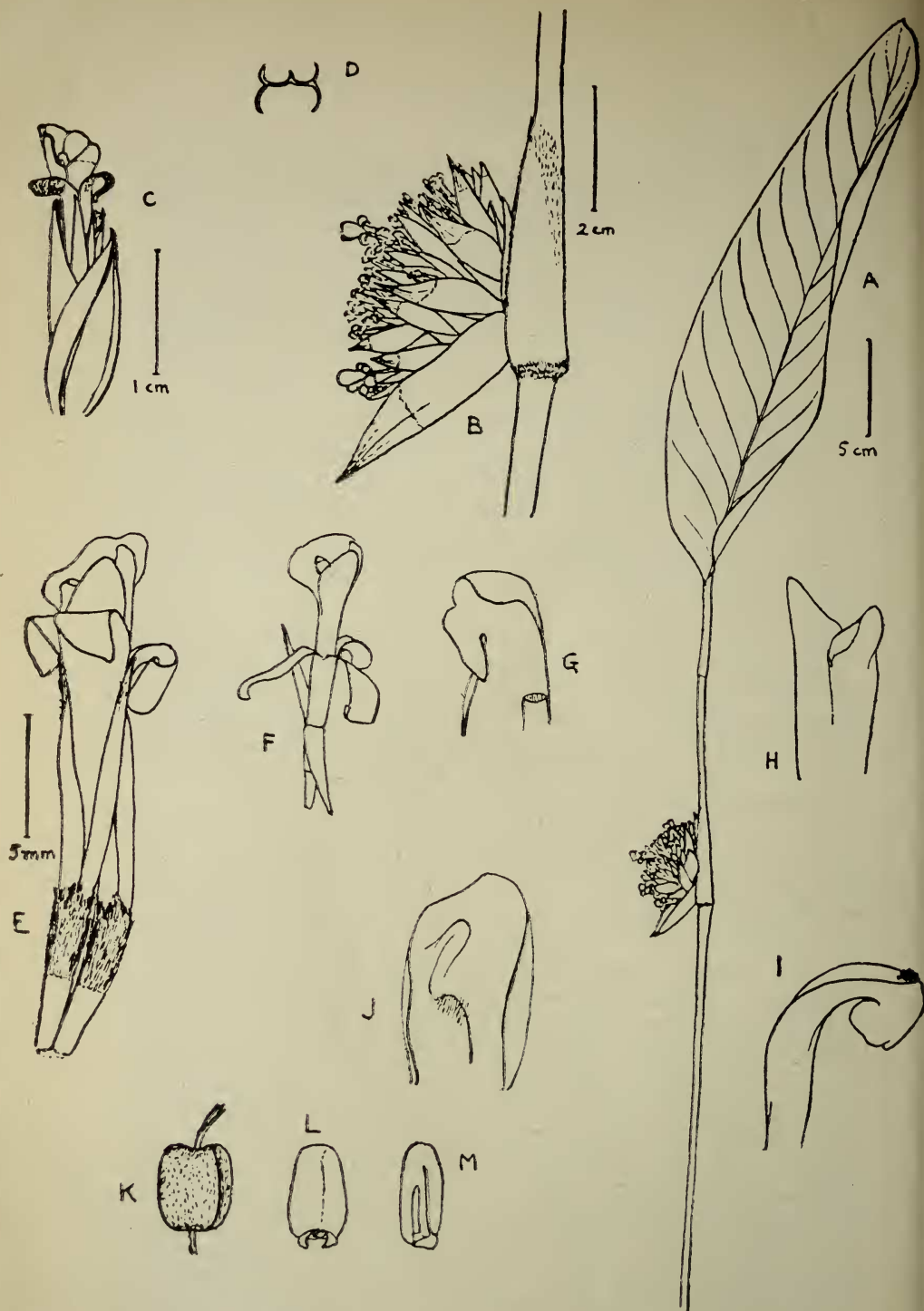


Fig. 4. *Phrynium capitatum*.

A, an inflorescence-branch, showing prophyll on right, mesophyll on left, one flower open and one faded; flower shows narrow erect sepal, reflexed petals (dotted), outer staminodes and fleshy staminode (on right). D, transverse section of a tricarinate prophyll. E, a pair of flowers, one open and one faded; ovaries and tips of sepals are hairy; petals are reflexed; fleshy staminode is in middle of flower with outer staminodes behind it. F, a single flower with petals and sepals pulled down to show the longer stamen-tube. G, hooded staminode after removal of style and stigma. H, stamen, with petaloid appendage on left. I, stigma after release from hooded staminode; receptive surface faces downwards, pollen deposited from anther is on back of stigma. J, fleshy staminode. K, fruit. L, axile view of seed, with aril at base. M, longitudinal section of seed showing embryo (on left) and perisperm canal; one wing of aril below.

less densely hairy, 1-1.5 cm. long. *Corolla-tube* a little over half as long as sepals, flushed slightly with pink; lobes c. 10 by 3.5-4 mm., reflexed and rolled back in distal halves only, flushed with dull purple. *Tube of stamen and staminode* c. 3 mm. longer than corolla-tube. *Outer staminodes* white or very pale pink, unequal, obovate from a narrow base, the larger as long as the petals, 6-8 mm. wide, the smaller about half as wide and shorter. *Fleshy staminode* 5 mm. long, pink with a transverse line of deeper colour, the callus glabrous and white or yellowish. *Hooded staminode* a little shorter, pale yellow with darker tip, with a short deflexed triangular lobe. *Stamen* cream, with narrow petaloid appendage a little longer than the anther, adnate laterally throughout. *Stigma* pale pink. *Fruit* short-stalked, deep maroon, surface smooth and shining bearing scattered fine hairs, c. 1.2 cm. long and wide, somewhat 3-lobed, the apex broad with a slight depression, bearing the persistent sepals, 3-locular, 1-3-seeded. *Seeds* 9 mm. long, black when ripe, oblong as seen from the back, the back slightly grooved, with a fleshy bilobed basal aril, the lobes short and deflexed, 2.5 mm. wide, hardly seen in dried specimens.

This species is common throughout Malaya, and varies much in size. The larger plants have larger inflorescences with larger bracts and larger flowers; but I can see no other clear distinction. Some of the smaller plants, especially from the north of Malaya, look very different from the largest, and have proportionately narrow leaves with very hairy sheaths; but the structure of their inflorescences and their fruits are the same and also the flower-colour. S.F.N. 31635, from Grik (coll. Corner) is one of these small specimens; a flower in alcohol is identical in structure with others except that the outer staminodes are small, the largest being apparently about 4 mm. wide (it is not quite perfect).

Some mountain plants from the Taiping Hills have bracts and sepals unusually hairy, the hairy sepals especially being conspicuous when the bracts are reduced to a mass of fibres. These plants vary much in size of leaf and inflorescence.

In the field, the plain green leaves (slightly drooping, not erect) with pale lower surface, the shining maroon fruits and pinkish flowers are characters by which the species is easily recognised. The largest plants appear to be those growing in swamp-forest; those on hill-slopes being smaller; further observations on this are needed and



comparisons of the flowers of large and small plants to see whether there are differences other than those of size.

Ridley included the largest specimens of this species with his *P. hirtum* (as is evident from his citation of specimens) but his description of the leaves and fruits of *P. hirtum* indicates that he was mistaken in so doing. I can see no distinction between *P. malaccense* Ridl. (of which I have examined living plants as well as many dried specimens) and *P. capitatum* as described by Schumann and Gagnepain, and therefore reduce Ridley's species. *P. capitatum* is very widely distributed from India and southern China through Malaysia.

6. *Phrynium hirtum* Ridl., J.S.B.R.A.S. 32: 181. 1899. Flora 4: 289. Schum., Pflanzenr. Marant. 54 (copied from Ridley). *Phrynium inflatum* Merr., J.S.B.R.A.S. 85: 164. 1922. (?).

*Erect shoots* with few basal leaves and another leaf attached close below the inflorescence on a long terminal stem. *Leaf-blade* c. 30 by 7 to 65 by 20 cm., elliptic, apex acuminate, base rounded and then slightly decurrent to the petiole, lower surface purple (at least when young, sometimes throughout), hairy on sides of midrib; *petiole* together with sheath to 1.5 m. long, the swollen apical part to 10 cm. long, the sheath very hairy when young, sometimes glabrescent later, yellowish; *leaf on flower-stem* with petiole and sheath c. 30–70 cm. long, sheath long-hairy when young. *Peduncle* to c. 100 cm. long, hairy. *Inflorescence* on a stalk 1–6 cm. long beyond the base of the leaf-sheath, subtended by a deflexed very hairy sheath 5–10 cm. long (hairs tawny, 3–4 mm. long, falling when old); diameter of flowering inflorescence to about 5 cm. *All bracts* densely hairy, soon decomposing near the tips to groups of fibres; primary bracts of individual spikes c. 2.5 c.m. long; flowers 2 pairs or more. *Prophylls* hairy on the keels, 2nd one 3-keeled. *Mesophylls* present, the first one broad. *Ovary* densely covered with spreading silky hairs. *Sepals* 1.5 cm. long, hairy towards the tips. *Corolla-tube* c. 9 mm. long; lobes c. 1.0 by 0.3 cm. *Outer staminodes* unequal, one about 1.4 by 0.3 cm., the other 1.0 by 0.2 cm., both with long narrow base, widest near apex. *Fleshy staminode* about 8 mm. long. *Cucullate staminode* about 7 mm. long. *Stamen* c. 7 mm. long with no distinct petaloid appendage. *Fruits* c. 1.3 cm. long and 1.6 cm. wide, dull ochre (Corner), hairy when young, almost glabrescent when old with rough

surface, somewhat 3-lobed, the apex not depressed, dehiscent; pericarp tough and woody when dry. *Seeds* 3, about 8 mm. long and wide, nearly round as seen from the back, with 2-lobed deflexed basal aril.

Ridley's list of specimens under the original description of *P. hirtum* includes two distinct species. Most of the specimens are large plants of *P. malaccense*; but the description applies almost exclusively to the others (two only). The significant points in the description are: (1) young leaves with the backs red, (2) stout sheath near the inflorescence woolly, (3) seeds large, the backs rounded; none of these apply to *P. malaccense*. The large very hairy deflexed sheath below the inflorescence is the most conspicuous distinguishing feature of plants with young inflorescences; in fruiting plants the fruits are distinctive. The details of the flower given above are taken from a dried specimen (Ridley's from Bujong Malacca) and may not be very accurate.

In Ridley's list of specimens, the two representing the true *P. hirtum* (G. Pantl and Perhentian Tinggi) are not very good. I therefore have chosen another to serve as the type of the species. It was collected by Ridley before 1899 and must have been in his herbarium when he described the species, though he does not mention it. It is the only sheet which bears the information 'flowers white', which is mentioned in the description.

This species is allied to *P. basiflorum*, having very similar fruits, but differs in the inflorescence much raised above the ground, in the large deflexed hairy basal sheath, in the leaves not being variegated, and in the flowers, which are said to be white (Ridley) smaller than in *P. basiflorum* but with longer outer staminodes. In contrast to *P. basiflorum*, *P. hirtum* has been collected many times and is evidently locally abundant in swampy forest in the lowlands and at moderate elevations on the hills.

The species is distributed to Sumatra (Mentawi Islands, Kloss 14807) and Borneo (Sarawak, Hewitt 31). Merrill's *P. inflatum* from North Borneo is perhaps also the same.

**SPECIMENS.** *Perak*: Bujong Malacca, Ridley 9817 (p.p., the flowering specimen, *Type*). Ulu Temango, Ridley s.n. July 1909. *Trengganu*: Ulu Ayam Swamp, Kemaman, S.F.N. 30265 (Corner). *Selangor*: Kwang, Ridley s.n. August 1908. 15th mile Pahang Track, Ridley 8460. *Negri Sembilan*: Perhentian Tinggi, Ridley 10,001. Without locality Alvins 2277. *Johore*: Sungei Endau, S.F.N. 24945 (Holttum). Kukub, Ridley 13272. G. Pantl, 1,000 feet, Ridley, s.n. December 1892. Ulu Segun, G. Pantl, Corner s.n. 10.4.1936.

7. *Phrynium basiflorum* Ridl., J.S.B.R.A.S. 32: 182. 1899. Flora 4: 289. Schum., Pflanzenr. Marant. 56 (copied from Ridley). var. *nobile* Ridl., Journ. F.M.S. Mus. 4: 79. 1909.

*Erect shoots* bearing 2 or 3 leaves and a terminal inflorescence close to the ground. *Leaf-blade* drooping, purplish beneath when young, above rather light green with dark green oblique stripes from midrib to edge (sometimes unstriped ?), to about 55 by 20 cm., ovate, base broadly rounded, apex very shortly pointed, hairy on either side of the midrib beneath. *Petiole* with sheath to 2 m. long, base very stout, densely silky-hairy (hairs 5 mm. long), apical thickened part c. 10 cm. long. *Inflorescence* nearly spherical, c. 7 cm. diameter, on a scape 3-4 cm. long covered with densely hairy sheaths. *Bracts* c. 2.5 cm. long, hairy when young, when old disintegrating into fibres; each bract with 2 or more pairs of flowers. *Prophylls* hairy on the keels, second prophyll 3-keeled. *Mesophylls* present. *Ovary* densely hairy. *Sepals* c. 2-2.2 cm. long, hairy at tips, narrow. *Corolla-tube* 1.5 cm. long; lobes c. 1.3 by 0.4 cm., reflexed and curled, pink to rose-red. *Outer staminodes* joined at base to stamen, unequal; free parts c. 9 by 1 mm. and 5 by less than 1 mm. *Fleshy staminode* broadly obovate; white, c. 1.6 by 0.9 cm., with large 2-lobed callus, one lobe hairy. *Hooded staminode* yellowish, c. 9 mm. long. *Stamen* 9 mm. long with narrow petaloid appendage free half-way to the base. *Fruit* pinkish purple, then blackening, glabrescent when old, when dried with a rough dull surface, c. 1.5 cm. long and wide, 3-lobed, apex retuse, often 2-seeded.

In Ridley's original description of this species, he did not mention the colour of the leaves; later he described var. *nobile*, with leaves purple beneath and bearing dark stripes above. The only other collections, from G. Pantí, Johore, have striped leaves purple beneath; and the dried leaf of Ridley's original specimen appears as if it also was purple beneath. The details of the flower are taken from a specimen preserved in formalin. Ridley did not describe the very narrow outer staminodes.

This is a large handsome species, which is very conspicuous, but has only been collected at three rather widely separated localities, G. Pantí (Johore), Perhentian Tinggi (N. Sembilan) and Tapah (Perak). Corner reports that it

is common in granite valleys round G. Pantí, especially in swampy places. It is closely allied to *P. hirtum*, but differs in being usually larger, in the variegated leaves and the basal inflorescence; also in the absence of the long hairy downward-pointing sheath of *P. hirtum*.

In its very narrow outer staminodes and very large fleshy staminode it is strikingly different from *P. capitatum*. The colour of the fruit is reported by Corner only.

SPECIMENS. *Johore*: S. Segun, G. Pantí, S.F.N. 30680 (Corner). G. Pantí, west, low elevation, in *Dryobalanops* forest, S.F.N. 30957 (Corner). *Negri Sembilan*: Perhentian Tinggi, Ridley 10,000 (Type). *Perak*: Bidor, near Tapah, Ridley 14036 (forming huge clumps in forest swamps).

8. *Phrynium terminale* Ridl., J.S.B.R.A.S. 57: 105. 1910. Flora 4: 290.

*Erect shoots* each bearing 2 leaves with several bladeless sheaths (one sheath much longer than the others, c. 20–30 cm. long) and a terminal inflorescence on a slender peduncle, without any accompanying leaf. *Leaf-blade* c. 30 by 10 to 50 by 16 cm., nearly elliptic, widest a little above the middle, apex shortly acuminate, base rounded and then slightly decurrent to the petiole, texture thin, glabrous, lower surface of young leaves purplish (?); *petiole* with sheath to about 50 cm. long, thickened part 4–5 cm. long, sheath to about 20 cm., glabrous. *Peduncle* 25–35 cm. long, slender. *Inflorescence* erect, 6–7 cm. long, with about 8 spirally arranged broad bracts, the lowest one 5–6 cm. long, all soon decaying at the apex to a group of fibres, the lower ones with axillary spikes, glabrous. *Basal axillary spike* with about 7 bracts, bracts c. 3.5 cm. long. *Flowers* white, 2–3 pairs in axil of each bract, flowers of a pair not opening simultaneously. *Prophylls* after the first 3-keeled. *Mesophylls* not seen. *Pedicels of flowers* c. 5–7 mm. long. *Ovary* 3 mm. long, covered with appressed silky hairs. *Sepals* 2.3–2.5 cm. long, nearly 4 mm. wide, ends blunt, glabrous. *Corolla-tube* 1.0 cm. long; lobes c. 1.6 cm. long and 0.6 cm. wide, not reflexed, ends broadly rounded. *Stamen-tube* c. 7 mm. longer than corolla-tube. *Other staminodes* 2, subequal, narrow at the base and joined for some distance to the back of the stamen, about as long as the petals, their blades c. 5 mm. wide. *Fleshy staminode* a little longer than the petals, c. 9 mm. wide. *Hooded staminode* and *stamen* about same length, much shorter than fleshy staminode; stamen with adnate lateral narrow petaloid



appendage a little shorter than the anther. *Fruits* on pedicels 5 mm. or more long, oblong in outline as seen laterally, about 1.4 cm. long and 1.0 cm. diameter, surface dull and slightly hairy, dehiscent, 3-seeded. *Seeds* c. 1.1 cm. long, 8 mm. wide, oblong in outline as seen from the back, outer face slightly roughened, inner faces smooth, aril 2-lobed, the lobes 3-4 by 1.5 mm.

This interesting species, peculiar in its erect inflorescence without an accompanying leaf, has only been found three times, in the north of Malaya. The flowers are now described for the first time, from the collection S.F.N. 35005 (alcohol and dried material). Ridley only saw the fruiting inflorescence. The pedicelled very oblong dull fruits with oblong seeds are distinctive among known Malayan species.

Sometimes the inflorescence has a large sterile basal sheathing bract a few centimetres below the others, but this is unusual.

A specimen from Sumatra named *Phrynium obscurum* T. et B. (Lampung, Forbes 1043A) agrees closely with Peninsula specimens of *P. terminale*. The description of the species also agrees (so far as it goes, including sepals 2.5 cm. long) except that the corolla-tube is said to be 3 cm. long and the lobes violet-spotted. A study of fresh material from Sumatra is desirable.

**SPECIMENS.** *Kedah:* Ulu Lugong, S.F.N. 35005 (Kiah). *Perak:* Ulu Temango, Ridley 14416 (Type). Ulu Luat, Lenggong, F.D. 10372 (F. Ranger Hamid).

### PHACELOPHRYNIUM K. SCHUM.

*Vegetative habit* of *Phrynium*. *Inflorescence* a compound spike with distichous main bracts, and a group of subsidiary spikes in the axil of each of the lower bracts, which are widely spaced. *Prophylls* with 2 and 3 keels, and mesophylls, present in the partial inflorescences; bracteoles not seen. *Flowers* as in *Phrynium* but only one outer staminode present.

This genus is very nearly allied to *Phrynium* and *Calathea*. It differs from *Phrynium* in the 2-ranked bracts and the single outer staminode; and from *Calathea* in the very compound inflorescence. Schumann was much impressed with its resemblance to *Calathea* in the presence of tricarinate prophylls and also mesophylls; but he did not know that these occurred also in *Phrynium*.

I have stated that the bracts are distichous in *Phacelophrynium maximum*; but in the young subsidiary spikes they are not clearly so, and I suspect that the basal bracts of these spikes are in fact not distichous, as the basal leaves of a vegetative shoot are not always so. The main bracts of the inflorescence are however certainly distichous, and also those of the well-developed subsidiary spikes, and I believe this distinction from *Phrynium* to be a good one, *Phrynium* being limited as it is at present.

If the genus *Phrynium* is again extended to include *Stachyphrynium*, then probably *Phacelophrynium* should also be included, as it would only be distinct in its single outer staminode. This character is however so constant in the large genus *Calathea* that it may be regarded as of sufficient importance to warrant the maintenance of *Phacelophrynium* as a separate genus.

***Phacelophrynium maximum*** (Bl.) K. Schum., Pflanzenr. Marant. 122. 1902. *Phrynium maximum* Bl., Enum. Pl. Jav. 1: 37. 1827. *Phacelophrynium tapirosum* K. Schum. l.c. Ridley, Flora 4: 289. *Phrynium tapirosum* Ridl., Trans. Lin. Soc. 3: 382. 1893. J.S.B.R.A.S. 32: 180. 1899.

*Erect shoots* close together, each bearing 2–4 leaves at the base, with broad bladeless sheaths outside, and a terminal long-peduncled inflorescence usually without a leaf accompanying it. *Leaf-blade* to 60 by 25 cm., nearly elliptic, apex very shortly pointed, base rounded and slightly decurrent, glabrous, light green above, pale greenish beneath (not glaucous, never purple); *petiole* with sheath 100–150 cm. long, sparsely hairy towards the base, thickened part of petiole to about 10 cm. long, olive green, rest light green; sheath pale yellowish. *Peduncle* of inflorescence to 70 cm. long, hairy near the apex. *Inflorescence* c. 18–25 cm. long, the basal three bracts widely spaced with axillary spikes, the upper bracts forming a simple spike; lowest bract 5–10 cm. long, with 1–3 spikes in its axil and separated by an internode of 3.5–10 cm. from the next; second bract with 1–2 axillary spikes and separated by a shorter distance from the third. *Longest axillary spike* c. 11 cm. long with distichous bracts c. 3 cm. long. *Bracts* pale brown, their apices only soon decomposing, never rotted and fibrous to the base; about 3 pairs of flowers to a bract. *Flowers* white, the two of a pair not opening on the same day.

*Ovary with pedicel* c. 5 mm. long, the ovary with appressed silky hairs. *Sepals* 1.1 cm. long. *Corolla-tube* 1 cm. long; lobes 1.0 by 0.4 cm., bluntly rounded, not reflexed. *Staminode-tube* 3 mm. longer than corolla-tube. *Outer staminode* 1.0 by 0.5 cm., obovate. *Fleshy staminode* 1.2 by 0.8 cm., obovate, with 2 glabrous fleshy calli. *Hooded staminode* 9 mm. long, with triangular lateral lobe. *Stamen* 8 mm. long with no distinct petaloid appendage. *Fruit* c. 8 mm. long as seen from the side and somewhat flattened, outer surface smooth and sparsely hairy, apex not retuse, usually 2-seeded. *Seeds* oblong as seen from the back, c. 7 by 3.5 mm., the rounded back shining and finely wrinkled; aril of two narrow lobes about half as long as the seed.

Ridley described the inflorescence of his *P. tapiorum* as arising from a petiole, by which he meant that it had a leaf attached to the peduncle just below the inflorescence; but his specimens do not show this, and later collections show that the peduncle is normally leafless to the base of the plant. Corner reports that sometimes a leaf may be borne between the base of the plant and the base of the inflorescence, but this is exceptional.

The subsidiary inflorescences subtended by the basal bract are usually of unequal length, and have an arrangement exactly like the whole inflorescence of *Phrynium tristachyum* Ridl.

The species has been collected in four widely separated localities and no doubt occurs elsewhere in Malaya. It grows in large dense clumps, probably in wet ground near streams. Corner reports it 'common in all the stream swamps' in the Kemaman area in which he collected.

Schumann's description of *Phacelophrynium maximum* (Bl.) agrees well with the specimens of *P. tapiorum* (except that the bracts of the Peninsula plants are not much over 3 cm. long, whereas in *P. maximum* they are 4 cm.), and I think it almost certain that the two should be united. *P. maximum* occurs in Java, Sumatra and Borneo. There are Bornean specimens in the Singapore herbarium.

**SPECIMENS.** *Pahang*: Tahan River, Ridley 2398 (Type of *P. tapiorum*). *Selangor*: Ginting Bidai, Ridley 7793. *Trengganu*: Ulu Bendong swamp, Kemaman, S.F.N. 30292 (Corner). *Johore*: Bukit Tinjau Laut (Sedili), S.F.N. 37084 (Ngadiman). Sungei Kayu, in swamp, Kiah s.n. 13.3.37.